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Clause 98 Technology Ability Field

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Published Technology Ability Field Bits

- The technology ability field bit assignments from Table 98B-1, as modified by IEEE Std 802.3cy-2023, are shown in the following table:

Bit	Selector Description
A0	100BASE-T1 ability
A1	10BASE-T1S full duplex ability
A2	1000BASE-T1 ability
A3	2.5GBASE-T1 ability
A4	5GBASE-T1 ability
A5	10GBASE-T1 ability
A6	25GBASE-T1 ability
A9	10BASE-T1L capability
A22	10BASE-T1S half duplex capability
A23	10BASE-T1L increased transmit level request
A24	10BASE-T1L increased transmit/receive level ability
A25	10BASE-T1L EEE ability

Proposed New Technology Ability Field Bits

- The technology ability field bit assignments proposed by the 802.3dg and 802.3dm working groups are shown in the table below:

Bit	Selector Description
A10	100BASE-T1L ability
A11	100M + 2.5GBASE-T1/V1 ability
A12	2.5G + 100MBASE-T1/V1 ability
A13	100M + 5GBASE-T1/V1 ability
A14	5G + 100MBASE-T1/V1 ability
A15	100M + 10GBASE-T1/V1 ability
A16	10G + 100MBASE-T1/V1 ability
A21	100BASE-T1L increased transmit/receive level ability

Implications

- If we adopt all the technology ability field bit assignments currently proposed by the 802.3dg and 802.3dm working groups we will have used 20 of the available 27 bits
  - Future amendments will soon need to start using next pages
  - Next page exchange increases link establishment time even when connecting to existing PHYs, which is undesirable
  - There is even potential to encounter interoperability problems with existing non-compliant PHYs that do not respond correctly to next pages
- We are not using the technology ability bits efficiently
  - The bit assignments allow for all kinds of PHYs to share a link
    - For example, a PHY may advertise support for 10BASE-T1S half-duplex and 25GBASE-T1. How does this make sense?
  - If we want to change the approach, we need to do it now before any more technology bits are used up and it becomes too late

Proposal

- We propose to adopt a scheme that will indicate in general terms how all the unused bits in the technology ability field will be allocated
  - The goal is to ensure that PHYs that advertise a coherent selection of technology abilities are able to do so using only base page exchange
  - PHYs will not be prevented from advertising an unrestricted selection of technology abilities but may need to exchange a next page to do so
- The idea is to use bits A7, A8 and A26 to select a technology category and to use bits A10 to A21 to select a category-specific technology
  - Every PHY that advertises a technology ability that uses any of the bits A10 – A21 must handle the technology category

Technology Category Selection

- Bits A7, A8 and A26 select the technology category according to the following table:

A7, A8, A26	Category Selection
000	NULL
001	BASE-T1
010	BASE-T1L
011	Asymmetric BASE-T1/V1
…	…

- Once the category is selected, bits A10 to A21 become specific to that category
  - Existing technology bits will remain where they are
  - For example, a 10/100BASE-T1L PHY may select the BASE-T1L category, use bits A9, A23, A24 and A25 to advertise the 10BASE-T1L abilities as before, and use 2 of the bits A10-A21 to advertise the 100BASE-T1L abilities
- PHYs that specify a non-NULL technology category should only advertise abilities consistent with that category
- Existing PHYs are not affected by the technology category selection field
- Downshift is expected to become easier to specify if it is limited to specific technology categories

Technology Ability Bits for NULL Category

- When the category is NULL, any of the bits in Table 98B-1, as modified by IEEE Std 802.3cy-2023, may be set
- The proposed assignment of bits A10 - A21 is shown in the table below:

Bit	Selector Description
A10	100BASE-T1L ability
A11	100BASE-T1L increased transmit/receive level ability
A12	100M + 2.5GBASE-T1/V1 ability
A13	2.5G + 100MBASE-T1/V1 ability
A14	100M + 5GBASE-T1/V1 ability
A15	5G + 100MBASE-T1/V1 ability
A16	100M + 10GBASE-T1/V1 ability
A17	10G + 100MBASE-T1/V1 ability
A18 – A21	Reserved

  - 4 bits are available for future PHYs
- Technology bits will be assigned in the NULL category for every future PHY but a next page may be required soon to accommodate all of these bits

Technology Ability Bits for BASE-T1 Category

- When the category is BASE-T1, only bits A0 and A2 - A6 in Table 98B-1, as modified by IEEE Std 802.3cy-2023, may be set
- The assignment of bits A10 - A21 is shown in the table below:

Bit	Selector Description
A10 – A21	Reserved

  - 12 bits are available for future BASE-T1 PHYs

Technology Ability Bits for BASE-T1L Category

- When the category is BASE-T1L, only bits A9 and A23 - A25 in Table 98B-1, as modified by IEEE Std 802.3cy-2023, may be set
- The assignment of bits A10 - A21 is shown in the table below:

Bit	Selector Description
A10	100BASE-T1L ability
A11	100BASE-T1L increased transmit/receive level ability
A12 – A21	Reserved

  - 10 bits are available for future BASE-T1L PHYs

Technology Ability Bits for Asymmetric Category

- When the category is Asymmetric BASE-T1/V1, none of the bits in Table 98B-1, as modified by IEEE Std 802.3cy-2023, may be set
- The assignment of bits A10 - A21 is shown in the table below:

Bit	Selector Description
A10	100M + 2.5GBASE-T1/V1 ability
A11	2.5G + 100MBASE-T1/V1 ability
A12	100M + 5GBASE-T1/V1 ability
A13	5G + 100MBASE-T1/V1 ability
A14	100M + 10GBASE-T1/V1 ability
A15	10G + 100MBASE-T1/V1 ability
A16 – A21	Reserved

  - 6 bits are available for future Asymmetric BASE-T1/V1 PHYs
- Could consider separate Asymmetric BASE-T1 and Asymmetric BASE-V1 technology categories if that is of any interest – but prefer not to waste a category if this is not useful
  - Could also separate the T1 and V1 abilities by using different bits – but then there would be no spare bits left

Support for Unrestricted Technology Selection

- By selecting the NULL category, a PHY indicates that it wishes to advertise an unrestricted selection of technologies
  - For the NULL category, bits A10 to A21 allow us to advertise 12 more abilities beyond those already published
  - This is enough to support 100BASE-T1L and MultiG/100MBASE-T1/V1
  - Once we run out of bits in the NULL category (or later in any other category) we will need to define a Message Code in Annex 98C for extended technology abilities
    - Clause 98 message pages each provide 32 unformatted bits – so one extended technology abilities message page will get us a long way
    - The assignment of these 32 bits will be specific to the category specified in the base page
  - We can define technology ability bits both in bits A10 – A21 of the base page for a specific category and in an extended technology abilities message page for the NULL category
    - This allows a PHY either to specify a specific category and use the base page only or to use the NULL category and extend the abilities into a next page. This way PHYs that wish to advertise an unrestricted selection of abilities can continue to do so, but they are the ones that have to pay the price in terms of link time.